# CALIFORNIA AIMS TO INCENTIVIZE UTILITIES TO ADOPT THIRD-PARTY ENERGY RESOURCES

*By Constance Douris*

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Lexington Institute

FUTURE OF THE POWER GRID SERIES

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## EXECUTIVE SUMMARY

California's ambitious policy goals of reducing greenhouse emissions and increasing renewable resources could be assisted by third-party energy sources. Distributed energy resources are defined as renewable generation sources, energy efficiency, energy storage, electric vehicles, and demand response technologies.[1] Such third-party resources, which have been around since Thomas Edison built the first power plant in 1882,[2] can help the grid resist failure and allow for a quick recovery in the event of a power outage.

Currently, utilities in California are able to generate a profit when replacing or upgrading components of the electric grid, such as poles, wires transformers and substations, but lose money when adopting distributed resources because customers are not purchasing as much electricity from them. Because utilities have averted pursuing these new technologies, lower rates for electricity customers have not been realized and improvements to the electric grid have been delayed, conflicting with the public interest of building and maintaining an affordable grid.[3]

The California Public Utilities Commission has recognized that utilities are hesitant to pursue third-party energy sources because they are riskier and are negatively impacted by doing so. In December 2016, the CPUC approved a pilot program to incentivize utilities to incorporate cost-effective distributed resources. Utilities must each identify at least one project and up to three more additional projects to receive a four percent financial incentive that will be applied to the annual payment of the resource.

*— continued*

While the CPUC aims to motivate utilities to adopt more distributed energy resources, it does not want electricity customers to pay more as a result. This is why the pilot program requires that distributed resources plus the financial incentive must cost less than the traditional investments they replace. The CPUC will establish limitations on the deployment of third-party energy sources to locations where benefits exceed costs.

The electric grid is currently designed to carry electricity one way, from centralized generating facilities across many miles to users. Unlike outdated, one-way power flows, distributed resources allow for the two-way flow of electricity. This provides some advantages, such as selling excess electricity to the grid to make up for deficiencies and make the grid more resilient and reliable. However, two-way flows also involve some uncertainty because electricity will be obtained from unreliable sources and many participants will be using different technologies.

To prevent power disruptions, the pilot program requires utilities to develop contingency plans to ensure the uninterrupted flow of quality electricity. Utilities in California will increasingly adopt available tools to identify optimal locations for third-party energy sources, including management systems, data and information.

# INTRODUCTION

As demand increases on the nation's electric grid and power quality problems, power outages and electricity prices rise, customers are seeking more reliable electricity.[4] Regulatory shifts have also created an environment aiming for the expansion of distributed energy resources. California's environmental and energy policies coupled with customer choices enabled by technology are changing the state's power system.

Distributed energy resources help meet electricity supply and demand and make the grid more resilient and reliable. These third-party sources are defined[5] as renewable resources, energy efficiency, energy storage, electric vehicles, and demand response technologies.[6] Such distributed resources have been around since Thomas Edison built the first power plant in 1882, and recent technological developments have powerful new benefits.

The electric power system consists of four physical elements: energy generation, high-voltage transmission, lower-voltage distribution and energy consumption or load.[7] Traditionally, electricity is delivered in one direction from the generator through transmission lines to the consumer. The nature of electricity generation, delivery, and consumption are changing rapidly[8] to prevent power disruptions from storms, flooding, cyber-attacks and other threats and to increase resiliency and reliability of the grid.[9] Utilities are facing a new market landscape where electricity is moving from a centralized structure towards a decentralized future.[10]

California's ambitious policies aim to reduce greenhouse gas emissions by 40 percent from 1990 levels, increase the amount of electricity generated from renewable sources to 50 percent, and encourage widespread transportation electrification.[11] Distributed energy resources will play an increasing role to meet these policy goals, help provide supply and demand of electricity, and allow for a quick recovery if a power outage were to occur. A 2013 California law requires utilities to reform distribution planning to minimize costs and maximize benefits for ratepayers while promoting incentives to support distributed resources.

*Distributed resources help meet electricity supply and demand, similar to a diversified investment portfolio where holding assets across a range of investments balances the risk of failure.*

Utilities are hesitant to employ third-party sources because less electricity will be purchased from them, resulting in a negative financial impact. Today, utilities in California can earn a profit by investing in traditional infrastructure, such as power lines, poles, wires, transformers and substation upgrades. This outdated regulatory model focused on increasing electricity access motivates utilities to build more of such infrastructure for profit, conflicting with the public interest of building and maintaining an affordable grid. Hence, there is no reason for utilities, which are regulated monopolies, to pursue riskier innovations unless directed by the regulatory

environment. Meanwhile, energy resources that could save electricity customers money are hindered from accessing the market because utilities would rather invest in areas they can control and where they can make a profit.

*Wind power is one type of distributed energy resource that can help meet electricity supply and demand and make the grid more resilient and reliable.*

In December 2016, the California Public Utilities Commission approved a pilot program to financially incentivize utilities to use more distributed resources. This is the first time a California regulator has introduced a detailed proposal with an alternative rate structure to adopt third-party energy sources while allowing utilities to make a profit doing so. This new pilot, if successful, could help California attain its ambitious policy goals, make the grid more resilient and reliable, and may be replicated in other states to create a more stable electric grid.

## THE NEW CALIFORNIA PILOT PROGRAM

Third-party energy sources can make up for deficiencies on the grid to resist failure and allow for a quick recovery in the event of a power outage. These resources allow for more customer choice as they generate electricity near the point of use, decrease or increase demand as needed and store electricity to use in the future or sell to the grid. Examples of different types of distributed energy resources include solar photovoltaic, wind, combined heat and power, electricity storage, demand response, electric vehicles, and microgrids.

The California Public Utilities Commission (CPUC) has attempted to motivate utilities to adopt distributed energy resources through policies as far back as 2001.[12] The incorporation of distributed resources means customers will buy less electricity from utilities. As a result, utilities have been hesitant to bring more third-party sources online since their use means less profit. Very few cases of these resources replacing traditional upgrades, such as power lines, poles, wires, transformers and substations, exist in California. The CPUC's 2014 Distribution Resources Plan in particular failed to account for the fact that utilities experience a negative financial impact by procuring distributed resources. As a result, improvements to the electric grid have been delayed and lower rates for electricity customers have not been realized.

To solve the dilemma of utilities not being able to make a profit when adopting third-party sources, the CPUC introduced a draft proposal of a program in April 2016.[13] The proposal stated that a distributed resource project must replace a traditional investment for less cost and that utilities will receive a financial benefit for doing so. This is the first time a California regulator has introduced a detailed proposal with an alternative economic structure to achieve this aim.

Several stakeholders including California's three largest utilities, Pacific Gas and Electric, San Diego Gas and Electric, and Southern California Edison, commented on the proposal. Some organizations were critical of the pilot, claiming that it will likely not be enough for utilities to overcome their sensitivity to risk and to deploy more distributed energy resources.[14]

After the CPUC heard from various parties about the pilot in public workshops, an amended version was filed in September 2016.[15] The CPUC found that offering an incentive for utilities to adopt third-party energy sources could create more opportunities for their use. For instance, a financial incentive could be used to provide bonuses and other monetary incentives to employees in distribution planning and related areas.

*The California Public Utilities Commission found that offering an incentive for utilities to adopt third-party energy sources could create more opportunities for their use.*

The proposal was officially approved by the CPUC in December 2016.[16] The utilities will obtain a four percent financial incentive that will be applied to the annual payment of the resource. Pacific Gas and Electric, San Diego Gas and Electric and Southern California Edison each must identify at least one and up to three optional pilot projects. The minimum one project requirement allows the framework to be tested and the additional projects provide greater insight as to whether utilities are incentivized to adopt more distributed resources. Ideally, a diverse set of third-party energy source projects will be tested in a variety of situations.

## ENSURING CUSTOMERS DO NOT PAY MORE FOR ELECTRICITY

Today, the cost of electricity is lumped together with funds needed for grid operation and to meet policy goals. These costs, however, are based on outdated centralized resources and one-way power flows.[17] Distributed resources could provide cost-effective alternatives to traditional grid investments because they are small in size and do not involve major expenses, such as those required to construct high-voltage transmission lines. Third-party energy sources could also be built faster with less risk than larger investments such as power plants.

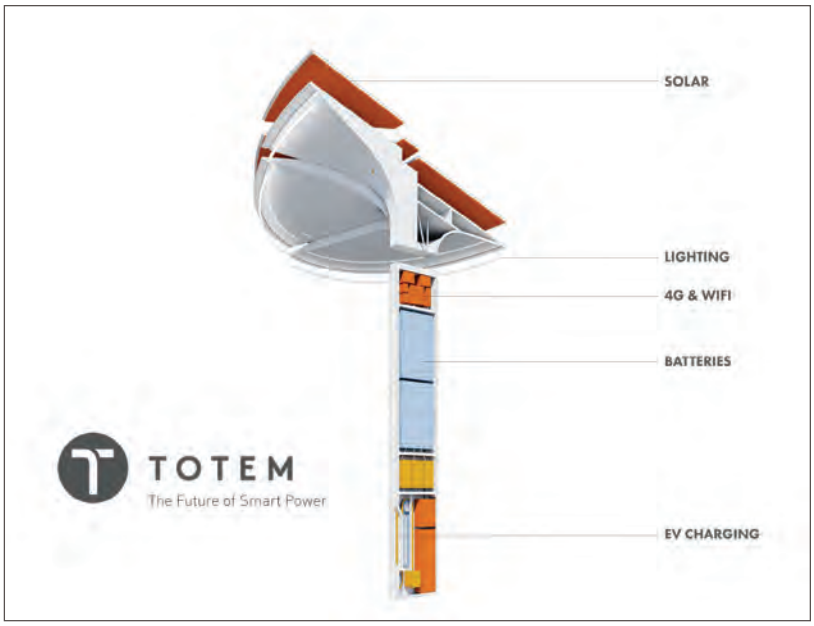
While the CPUC aims to motivate utilities to adopt more distributed energy resources, it does not want electricity customers to pay more as a result. This is why the pilot program

requires that third-party resource projects plus the financial incentive must cost less than the traditional projects they replace. The utility is to record the value of the incentive in an account and the profit will be claimed in a subsequent application, assuming the project successfully replaces or delays a traditional distribution project.

The CPUC will establish limitations for the deployment of distributed resources to locations where benefits exceed costs. It is vital for the CPUC to consistently monitor the impact of distributed resources on the electric grid to ensure rates do not increase. If electricity costs increase for customers, rate designs and compensation methods must be modified as technology continues to develop and as distributed resources are adopted.

*The California Public Utilities' new pilot program requires that third-party resource projects plus the financial incentive must cost less than the traditional investments they replace.*

Another issue related to cost is that some distributed resources provide more than one service. For instance, Sunverge's Solar Integration System[18] maximizes on-site solar generation with utility services such as demand response and voltage regulation. In addition, Totem Power's next generation utility pole combines solar photovoltaic, electricity storage, Wi-Fi and 4G communications hubs and an electric vehicle charging port. Thirdly, battery storage devices alone can provide up to 13 different services to utilities, electricity customers, and independent system operators and regional transmission organizations.[19]




*Totem Power's next generation utility pole that combines solar photovoltaic, electricity storage, Wi-Fi and 4G communications hubs and an electric vehicle charging port is one example of how distributed resources can provide more than one service.*

The CPUC was not able to decide on a method to avoid double counting multiple services that could be provided by one distributed resource for the pilot program. Each of the utilities is to pursue a different counting approach in the pilot program and work with an advisory group to finalize the method. Utilizing different approaches will allow the utilities to evaluate the best counting approach that provides the greatest outcome for ratepayers, and the CPUC will decide which approach to adopt after the pilot is evaluated.

## ELECTRIC GRID STABILITY UTILIZING THIRD-PARTY ENERGY SOURCES

Currently, the grid is designed to carry electricity one way from centralized generating facilities across many miles to consumers. In contrast, distributed resources generate electricity in multiple ways and are located in several places on the grid. Unlike outdated, one-way power flows, distributed resources allow for the two-way flow of electricity which provide some advantages, such as selling excess electricity to the grid. The bidirectional flow involves some uncertainty because electricity will be obtained from unreliable sources and many participants will be using different technologies.

*Unlike outdated, one-way power flows, distributed resources allow for the two-way flow of electricity which provides some advantages, such as selling excess electricity to the grid.*

With supportive policies and technologies, distributed resources could make the electric grid more resilient and reliable. For instance, microgrids utilize generation assets, such as renewables, co-generation and traditional energy sources, that can be used by those connected to the source or sold to the grid. During times of electricity disruption, the number of homes and businesses affected by an outage is reduced, similar to a diversified investment portfolio where holding assets across a range of investments balances the risk of failure.

Another example is demand response, such as an energy consumption switch on home appliances. This allows machines such as air conditioner units, electric water

*Demand response, such as an energy consumption switch on a clothes dryer, allows machines to be turned on or off remotely after receiving a signal from the electricity company. Such load switches can help prevent power outages when electricity storage, transmission or generation resources cannot meet demand.*

heaters, and clothing dryers to be turned on or off remotely after receiving a signal from the electricity company. The utility sends a signal to customers when demand is low and allows consumers to save money because electricity will be available at a lower cost. Such load switches can help prevent power outages when electricity storage, transmission or generation resources cannot meet demand. Costs for the utility companies are also reduced because they would not need to buy expensive electricity from other companies. In addition, storage allows parties to save electricity for future use or to sell it to meet demand. This boosts the resiliency of the grid by making up for deficiencies and preventing power outages.

*Solar power is one type of distributed energy resource that is dependent on weather conditions, making it challenging for operators to match generation load at every moment.*

Because the grid is not designed to handle reverse flows of electricity, high levels of distributed resource penetration could cause high-voltage swings to occur in extreme cases. This could harm or put stress on customer equipment, such as circuit breakers, and make the operation of the distribution system more difficult, especially during emergencies and planned outages.

California's pilot program requires the utilities to identify where third-party energy resources could be placed on the grid. Analyses of multiple scenarios and energy flows moving in many directions across the electric grid need to be conducted to ensure grid stability. Stress testing could help relieve concerns and ensure distributed resources are capable of providing electricity. Such experimentation should cover a 20-year time period, and include a range of different types of distributed resources and the dispersion patterns of the electricity it provides.

Grid operators need to locate and plan for electricity production to ensure proper operation of the grid. Some distributed resources are located "behind the meter" where the electricity produced is intended for on-site use in a home or office building, creating challenges for grid operators such as regional blackouts. In addition, some third-party sources such as solar and wind power are dependent on weather conditions. This variability can create extreme changes in power output over short periods, making it difficult for operators to match generation load at every moment and could create grid instability.

Data and information will be needed for operators and providers to properly manage the grid. Information, such as hosting capacity analysis, interconnection studies, and short and long-term operational planning, would allow for the optimization of different distributed resources specific to their location on the grid. Such data would also allow regulators to make better decisions about the performance of the distributed system. Sharing such data, however, requires navigating challenging issues about privacy, security and market design.[20]

New operational models, market structures to conduct risk management, and systems architectures, including infrastructure upgrades and new distributed control systems, will be needed to ensure operation of distributed resources. For instance, planning for third-party sources must include assessments of highly volatile supply and demand resources that result from consumer behavior.

Electric vehicles are expected to become more common in the future, especially in high-income areas with environmentally conscious consumers. As more people need to charge electric vehicles, the peak to average demand could increase and reduce capacity utilization and increase rates depending on when they are charged. If users charge their vehicles immediately when they return home from work, they would significantly add to peak energy consumption times, but if more are charged overnight, electricity demand would increase when it is otherwise low.

Management systems also exist to help identify optimal locations for third-party sources that could help utilities assess impacts and identify available capacity. Advanced Distribution Management Systems allow utilities to better understand real-time conditions across service territory with communication, intelligence, and visibility of the distribution grid. Several utility systems related to outage management, geographical information and customer information are also consolidated.

Distributed Energy Resource Management Systems allow utilities to dispatch resources to forecast supply and demand conditions up to 24-48 hours in advance, integrate data with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other utility systems, and communicate with third-party and aggregator systems. These tools could also support microgrids that provide reliable electricity for an industrial entity or a hospital, providing additional value to customers and the utilities in times of need. As deployment of third-party energy sources increases, utilities can use such information about the grid to meet customer demands while maintaining grid reliability, resiliency and flexibility.

## BACKUP PLANS FOR POWER DISRUPTIONS

The success and competitiveness of the U.S. economy is dependent on the uninterrupted flow of quality electricity. Power outages come in different forms and durations and are rarely predictable or preventable. Grid reliability problems occur today, even with predictable sources of energy like nuclear, fossil fuels and hydroelectric. This is because stability depends on the balance of electricity supply and the minute-to-minute changes in demand.

Electricity interferences must be planned for, and contingency plans could minimize negative economic effects. Because there may be times when a distributed resource is unable to operate or may experience disruption, the CPUC pilot program requires utilities to develop contingency plans with an advisory group. Transparency and cross-jurisdictional cooperation along with infrastructure upgrades and new distributed control systems are also necessary to increase electricity reserve and prevent interruptions.

*Third-party energy sources can make up for deficiencies on the electric grid to resist failure and allow for quick recovery in the event of a power outage.*

More situational awareness of the electric grid will be needed to increase distributed resource stability. Faster response times could be provided by embedded machines and sensors to manage many variables simultaneously in real time to maintain grid stability and reliability. Phasor measurement units also use sensors to monitor characteristics in small increments, about 30 to 120 samples per second, and are time stamped and synced with other units to get a clear picture of activity. Such data allow control systems and operators to see disturbances as they begin to develop, analyze the situation in relation to information from other parts of the grid and take corrective action. This enables operators to anticipate contingencies, reduce the risk of wide-area blackouts, enhance system efficiency and improve system models.

# CONCLUSION

Distributed resources help meet electricity supply and demand, similar to a diversified investment portfolio where holding assets across a range of investments balances the risk of failure. Utility customers have become increasingly interested in managing electricity use to reduce their bills and increase grid resiliency and reliability when power disruptions occur, especially as costs for such technologies, such as battery storage and demand response control devices, are becoming more affordable.

Utilities in California are able to make money when they invest in traditional infrastructure for the grid such as poles, wires and substations. Third-party energy sources are not widely adopted by utilities because they lose money when customers do not purchase as much electricity. There is no reason for utilities to pursue riskier innovations unless the regulatory environment directs them to do so. As a result, improvements to the electric grid have been delayed and lower rates for electricity customers have not been realized, conflicting with the public interest of building and maintaining an affordable grid.

The California Public Utilities Commission decided to address this conflict by approving a pilot in December 2016. The new program aims to allow utilities to make a four percent financial incentive applied to the annual cost of the third-party energy source. After all, more distributed resources on the grid will help California attain its ambitious policy goals to reduce greenhouse gas emissions, increase electricity generated by renewable sources of energy, and boost resiliency and reliability of the grid.

While the CPUC aims to motivate utilities to adopt more distributed energy resources, it does not want electricity customers to pay more as a result. This is why the pilot program requires that third-party resource projects plus the financial incentive must cost less than the traditional projects they replace. The pilot program also requires that utilities develop contingency plans in case a distributed resource is not able to function.

Stable electricity is essential for the economy and all who participate in it as research has shown increasing electricity use is positively correlated with advances in income, education and health. More distributed resources in California will allow customers to better control electricity usage and increase reliability, balance the electric grid in real time, and assure that electricity loads do not exceed supply while saving money.[21] A refined version of this pilot program could be utilized in other states to motivate utilities to pursue distributed resources.

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